City of Rochester

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Bureau of
Architecture and
Engineering

October 13, 2015

ADDENDUM NO. 1

PROJECT TITLE: Public Safety Building UPS System Replacement

PROJECT NO.: 14058

Invitation to Bid No. CO4420

Instruction to Bidders:

1. In the Contract Documents, **REPLACE** Specification Section 263353 Static Uninterruptible Power Supply with the attached revised Specification Section 263353 Static Uninterruptable Power Supply.

2. **SIGN** this Addendum below acknowledging receipt and understanding, **INSERT** it in the bidding document, and **RETURN** it with your bid.

Date, time, and place of bid opening remain unchanged.

CITY OF ROCHESTER

Holly Barrett, P.E.
Assistant City Engineer

CITY OF ROCHESTER

Charles Zettek, Jr.
Purchasing Agent

The undersigned bidder acknowledges receipt and understanding of ADDENDUM NO. 1.

Date_____, 2015

_____
Name of Company

_____
Authorized Signature

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SECTION 26 33 53

STATIC UNINTERRUPTIBLE POWERSUPPLY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This specification defines the electrical and mechanical characteristics and requirements for a continuous-duty three-phase, solid-state, scalable (field-upgradable) uninterruptible power system (UPS). The UPS shall provide high-quality AC power for sensitive electronic equipment.

1.3 STANDARDS

A. The UPS shall be designed in accordance with the applicable sections of the current revision of the following documents. Where a conflict arises between these documents and statements made herein, the statements in this specification shall govern.

1. UL Standard 1778
2. CSA 22.2, No. 107.1
3. FCC Part 15, Class A
4. IEC 61000-4-5
5. NEMA PE-1
6. IEEE 519
7. ISTA_1H

B. The UPS shall be UL and cUL listed per UL Standard 1778.

1.4 SYSTEM DESCRIPTION

A. Design Requirements - UPS Module

1. Voltage. Input/output voltage specifications of the UPS shall be:
   a. Rectifier Input: 480 volts, three-phase, 3-wire-plus-ground
   b. Bypass Input: 480 volts, three-phase, 3-wire-plus-ground
   c. Output: 480 volts, three-phase, 3-wire-plus-ground
2. Output Load Capacity: Specified output load capacity of the UPS shall be 80 kVA at 0.9 lagging power factor.
   a. Scalable Output Capacity. UPS rated output capacity must be scalable by means of a software update which will require no hardware modifications to the UPS. 80kVA UPS model supplied will be scalable from 80kVA to 120kVA.
3. Parallel Operation: Up to four (4) UPS module outputs may be connected together in parallel to provide up to 3X maximum output capacity with redundancy.
4. Current Sharing: When multiple UPS modules are connected in parallel and powering a common load, each UPS module output current will not differ by more than 5% of the

rated full load current of one UPS module.

B. Design Requirements – Battery

1. Battery Cells: Valve-regulated, lead acid batteries.
2. Reserve Time: 6 minutes at 120kVA, 0.9 power factor, with ambient temperature of 77°F (25°C). Unit shall provide terminal for connection of external batteries.
3. Recharge Time: to 95% capacity within ten (10) times discharge time.

C. Modes of Operation

1. The UPS shall be designed to operate as an on-line, double-conversion, reverse-transfer system with the following operating mode.
   a. Normal - The critical AC load is continuously supplied by the UPS inverter. The rectifier/charger derives power from an AC source and supplies DC power to the inverter while simultaneously float-charging the reserve battery.
   b. Emergency - Upon failure of utility AC power, the critical AC load is supplied by the inverter, which obtains power from the battery. There shall be no interruption in power to the critical load upon failure or restoration of the utility AC source.
   c. Recharge - Upon restoration of utility AC power after a utility AC power outage, the rectifier/charger shall automatically restart and assume the inverter and battery recharge loads.
   d. Bypass - If the UPS must be taken out of service for maintenance or repair or if the inverter overload capacity is exceeded, the static transfer switch shall perform a reverse transfer of the load from the inverter to the bypass source with no interruption in power to the critical AC load.
   e. Eco-Mode - When this mode is enabled by service personnel the UPS will power the critical load through the UPS static bypass. If the bypass source becomes unqualified the UPS will switch to Normal mode of operation as defined above. Utility power is considered unqualified when either the input voltage varies more than +10% of rated voltage or the input frequency varies beyond +10% of 60Hz. Ten (10) minutes after the bypass source becomes qualified the UPS will automatically transfer to Eco-Mode of operation.

D. Performance Requirements

1. AC Input to UPS
   a. Voltage Configuration for Standard Units: 480V, three-phase, three-wire plus ground
   b. Voltage Range: +15%, -20% of nominal without derating
   c. Frequency: 57-66 Hz
   d. Power Factor:
      1) >0.99 at nominal input voltage and full-rated UPS output load
      2) >0.98 at nominal input voltage and half-rated UPS output load
   e. Inrush Current: UPS inrush current not to exceed 1.5 times rated input current. Maintenance bypass and distribution cabinet inrush current not to exceed 8 times rated input current.
   f. Current Limit: 140% of nominal AC input current maximum
   g. Current Distortion: <3% reflected THD maximum at full load

h. Surge Protection: Sustains input surges without damage per criteria listed in IEC 1000-4-5

2. AC Output, UPS Inverter

a. Voltage Configuration: three-phase, 3-wire plus ground

b. Voltage Regulation:

1) ±1% three-phase RMS average for a balanced three-phase load for the combined variation effects of input voltage, connected load, battery voltage, ambient temperature and load power factor

2) ±2% three-phase RMS average for a 100% unbalanced load for the combined variation effects of input voltage, connected load, battery voltage, ambient temperature and load power factor

c. Frequency:

1) Nominal frequency ±0.05% for single unit

2) ±0.25% for paralleled units

d. Frequency Slew Rate:

1) Selectable from 0.1Hz/sec to 3.0Hz/sec maximum for single unit

2) Fixed maximum of 0.2Hz/sec for paralleled units

e. Phase Displacement:

1) ±0.5 degree for balanced load

2) ±1.0 degrees for 100% unbalanced load

f. Bypass Line Sync Range

1) ±2.0 Hz, field-selectable ±0.5 to 5.0 Hz

g. Voltage Distortion:

1) 1% total harmonic distortion (THD) for linear loads

2) <5% THD for 100% nonlinear loads (3:1 crest factor) without kVA/kW derating

h. Load Power Factor Range: 0.7 lagging to 1.0 leading without derating

i. Output Power Rating: Rated kVA at 0.9 lagging power factor

j. Overload Capability:

1) 110% for 1 hour

2) 125% for 10 minutes

3) 150% for 1 minute

k. Voltage Transient Response:

1) 100% load step ±5.0%

2) Loss or return of AC input power ±1.0%

l. Transient Recovery Time: to within 2% of output voltage within one cycle

m. Voltage Unbalance: 100% unbalanced load, ±2%

1.5 ENVIRONMENTAL CONDITIONS

A. The UPS shall be able to withstand the following environmental conditions without damage or degradation of operating characteristics:

1. Operating Ambient Temperature
   a. UPS Module: 32°F to 104°F (0°C to40°C)
   b. Battery: 77°F ±9°F (25°C ±5°C)
2. Storage/Transport Ambient Temperature
   a. UPS Module: -13°F to 158°F (-25°C to 70°C)
   b. Battery: -4°F to 92°F (-20°C to 33°C)
3. Relative Humidity
   a. 0 to 95%, non-condensing
4. Altitude
   a. Operating: to 6,562 ft. (2000m) above mean sea level without derating. Linearly derated from 100% load at 6,562 ft. (2000m) to 88% load at 9,843 ft. (3000m).
   b. Storage/Transport: to 40,000 ft. (12,200m) above mean sea level.
5. Audible Noise
   a. Less than 61dB for 40-80kVA model
   b. Less than 63dB for 100-120kVA model
   c. Less than 69dB for 160-200kVA model

1.6 SUBMITTALS

A. Proposal Submittals

1. Submittals with the proposal shall include:
   a. System configuration with single-line diagrams
   b. Functional relationship of equipment including weights, dimensions and heat dissipation
   c. Descriptions of equipment to be furnished, including deviations from these specifications
   d. Size and weight of shipping units to be handled by installing contractor
   e. Detailed layouts of customer power and control connections
   f. Detailed installation drawings including all terminal locations
   g. Factory Test Report: Comply with specified requirements.
   h. Field quality-control reports.
   i. Performance Test Reports: Indicate test results compared with specified
   j. Performance requirement, and provide justification and resolution of differences if values do not agree
   k. Operation and Maintenance Data: For UPS units to include in emergency, operation, and maintenance manuals.

B. UPS Delivery Submittals

1. Submittals upon UPS delivery shall include a complete set of submittal drawings and one

   (1) set of instruction manuals that shall include a functional description of the equipment with block diagrams, safety precautions, instructions, step-by-step operating procedures and routine maintenance guidelines, including illustrations.

1.7 WARRANTY

A. UPS Module

1. The UPS manufacturer shall warrant the UPS module against defects in materials and workmanship for 60 months after initial startup or 60 months after ship date, whichever period expires first. The warranty shall include all parts, labor, and scheduled service/maintenance calls.

B. Battery

1. The battery manufacturer's standard warranty shall be passed through to the end user. Warranty provided shall be a minimum of 5 years full and 7 years prorate from system start-up.

C. Field Service requirement

1. The UPS manufacturer shall provide and ensure timely response to the site, by a qualified technical specialist to address any failure, or critical system faults, during the warranty period.

a. Critical faults or system failures shall be responded to within 4 hours response time.

b. Non critical faults shall be responded to within 24 hours.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications

1. The manufacturer shall be ISO 9001:2000 certified.

B. Factory Testing

1. Before shipment, the manufacturer shall fully and completely test the system to assure compliance with the specification.

C. Power Quality Specialist Qualifications: A registered professional electrical engineer or engineering technician, currently certified by the National Institute for Certification in Engineering Technologies, NICET Level 4, minimum, experienced in performance testing UPS installations and in performing power quality surveys similar to that required in "Performance Testing" Article.

D. Testing Agency Qualifications: Member company of NETA or an NRTL.

E. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. UL Compliance: Listed and labeled under UL 1778 by an NRTL.

H. NFPA Compliance: Mark UPS components as suitable for installation in computer rooms according to NFPA 75

PART 2 PRODUCT

2.1 FABRICATION

A. Materials

1. All materials of the UPS shall be new, of current manufacture and high grade and shall not have been in prior service except as required during factory testing. All active electronic devices shall be solid-state. All power semi-conductors shall be sealed. Control logic and fuses shall be physically isolated from power train components to ensure operator safety and protection from heat. All electronic components shall be accessible from the front without removing sub-assemblies for service access.

2. Wiring

   Wiring practices, materials and coding shall be in accordance with the requirements of the National Electrical Code, OSHA and applicable local codes and standards. All bolted connections of busbars, lugs and cables shall be in accordance with requirements of the National Electrical Code and other applicable standards. All electrical power connections shall be torqued to the required value and marked with a visual indicator.

3. Provisions shall be made in the cabinets to permit installation of input, output and external control cabling, using raceway or conduit. Provision shall be made for top and bottom access to input, output, bypass and DC connections. In conformance with NEC, connection cabinets shall provide for adequate wire bend radius. All copper bus bars for customer power connections shall be tin plated for connection integrity.

B. Construction and Mounting

1. The UPS shall be in NEMA Type 1 enclosures, designed for floor mounting. The UPS shall be structurally adequate and have provisions for hoisting, jacking and forklift handling. Maximum cabinet height shall be 78.7 in. (2000mm)

C. Cooling

1. Cooling of the UPS shall be by forced air using a redundant fan configuration. Fan power shall be provided by the UPS.

2. The thermal design, along with all thermal and ambient sensors, shall be coordinated with the protective devices before excessive component or internal cabinet temperatures are exceeded. Air filters shall be located at the point of air inlet and be changeable.

2.2 COMPONENTS

A. Rectifier/Charger

1. General

   a. The term rectifier/charger shall denote the solid-state equipment andcontrols necessary to convert AC to regulated DC for input to the inverter and for charging the battery.

2. AC Input Current Limiting

   a. The rectifier/charger unit shall be provided with AC input current limiting whereby the maximum input current shall be limited to 140% of the full input current rating. Input current limit will be adjustable by service personnel to allow the UPS to be used with undersized feeder breakers.

3. DC Filter

   a. The rectifier/charger shall have an output filter to minimize ripple current into the battery. The AC ripple voltage of the rectifier DC output shall not exceed 1% RMS of the float voltage. The filter shall be adequate to ensure that the DC output of the rectifier/charger will meet the input requirements of the inverter without the battery connected.

4. Automatic Rectifier Restart

a. Upon restoration of utility AC power, after a utility AC power outage and prior to a UPS automatic end-of-discharge shutdown, the rectifier/charger shall automatically restart and assume the inverter and battery recharge loads.

5. Battery Recharge

a. In addition to supplying power for the inverter load, the rectifier/charger shall be capable of producing battery charging current sufficient to replace 95% of the battery discharge power within ten (10) times the discharge time. After the battery is recharged, the rectifier/charger shall maintain the battery at full charge until the next emergency operation.

6. Overvoltage Protection

a. There shall be DC overvoltage protection so that if the DC voltage rises to the preset limit, the UPS will shut down automatically and initiate an uninterrupted load transfer to the static bypass line.

B. Inverter

1. General

a. The term inverter shall denote the equipment and controls to convert DC from the rectifier/charger or battery to precise AC to power the load. The inverter shall be solid-state, capable of providing rated output power, and for increased performance the inverter shall be a pulse-width-modulated design and utilize insulated gate bipolar transistors (IGBTs).

2. Overload Capability

a. The inverter shall be capable of supplying current and voltage for overloads exceeding 100%. The inverter is to provide 150% of full load for 1 minute, 125% of full load for 10 minutes and 110% of full load for 1 hour. A status indicator and audible alarm shall indicate overload operation. The UPS shall transfer the load to bypass when overload capacity is exceeded.

3. Fault Clearing and Current Limit

a. The inverter shall be capable of supplying an overload current of 150% of its full-load rating for one minute. For greater currents or longer time duration, the inverter shall have electronic current-limiting protection to prevent damage to components. The critical load will be transferred to the static bypass automatically and uninterrupted. The inverter shall be self-protecting against any magnitude of connected output overload. Inverter control logic shall sense and disconnect the inverter from the critical AC load without the requirement to clear protective fuses.

4. Step Load Response

5. Voltage Distortion

a. Total harmonic distortion in the output voltage will not exceed 1% for 0% to 100% linear loads.

b. Total harmonic distortion in the output voltage will not exceed 4% for 0% to 100% non-linear loads.

c. Total harmonic distortion in the output voltage will not exceed 5% for 0% to 100% non-linear, unbalanced loads.

6. Phase Balance

   a. Electronic controls shall be provided to regulate each phase so that an unbalanced loading will not cause the output voltage to go outside the specified voltage unbalance or phase displacement. With 100% load on one phase (and 0% load on the other two phases) or 100% load on two phases (and 0% load on the other phase), the voltage balance is to be within 2% and the phase displacement is to be 120 degrees within ±1.5 degrees.

7. Inverter Shutdown

   a. For rapid removal of the inverter from the critical load, the inverter control electronics shall instantaneously turn off the inverter transistors. Simultaneously, the static transfer switch shall be turned on to maintain continuous power to the critical load.

8. Inverter DC Protection

   a. The inverter shall be protected by the following disconnect levels:

      1) DC Overvoltage Shutdown

      2) DC Under voltage Warning (Low Battery Reserve)—pre-warning time is adjustable

      3) DC Under voltage Shutdown (End of Discharge)

9. Output Frequency

   a. The output frequency of the inverter shall be controlled by a high-speed DSP capable of holding the inverter output frequency to within ±0.05% during steady state and transient conditions. Total deviation from the rated frequency, including short time fluctuations and drift, shall not exceed 0.05%.

C. Display and Controls

1. Monitoring and Control

   a. The UPS shall be provided with a microprocessor-based unit status display and controls section designed for convenient and reliable user operation. A graphical liquid crystal display (LCD) shall be used to show a single-line diagram of the UPS and shall be provided as part of the monitoring and controls sections of the UPS. All operator controls and monitors shall be located on the front of the UPS cabinet. Monitoring functions such as metering, status and alarms shall be displayed on the graphical LCD. Additional features of the monitoring system shall include:

      1) Menu-driven display with pushbutton navigation

      2) Real-time clock (time and date)

      3) Alarm history with time and date stamp

      4) Memory with battery backup

2. Metering

   a. The following parameters shall be displayed:

      1) Input AC voltage line-to-line

      2) Input AC current for each phase

      3) Input frequency

      4) Battery voltage

      5) Battery charge/discharge current

6) Output AC voltage line-to-line
7) Output AC current for each phase
8) Output frequency
9) Apparent power
10) Active power
11) Battery time left during battery operation

3. Selectable Input Contacts
   a. The UPS shall have these available selectable input contacts:
      1) On Generator
      2) Fast Power Off
      3) MBB Auxiliary Contacts
      4) Start Battery Test
      5) Fault Acknowledge
      6) Bypass and Inverter Off
      7) Stop Battery Test
4. Alarm Messages
   a. The following alarm messages shall be displayed:
      1) Mains Voltage Abnormal
      2) Mains Undervoltage
      3) Mains Freq. Abnormal
      4) Charger Fault
      5) Battery Reversed
      6) No Battery
      7) Control Power 1 Fail
      8) Parallel Comm. Fail
      9) Bypass Unable To Track
      10) Bypass Abnormal
      11) Inverter Asynchronous
      12) Fan Fault
      13) Control Power 2 Fail
      14) Unit Over Load
      15) System Over Load
      16) Bypass Phase Reversed
      17) Transfer Time-Out
      18) Load Sharing Fault
      19) Parallel Connect Fault
      20) Bypass Over Current

21) Output Ground Fault

5. Status Messages

a. The following UPS status messages shall be displayed:

1) Rectifier (Off / Soft Start / Main Input On / Battery Input On)

2) Input Supply (Normal Mode / Battery Mode / AllOff)

3) Battery Self Test (True / False)

4) Input Disconnect (Open / Closed)

5) EPO (True / False)

6) Charger (On / Off)

7) Output Disconnect (Open / Closed)

8) Maint. Disconnect (Open / Closed)

9) Bypass Disconnect (Open / Closed)

10) Inverter (Off / Soft Start / On)

11) Bypass (Normal / Unable To Trace / Abnormal)

12) Output Supply (All Off / Bypass Mode / Inverter Mode / Output Disable)

13) Inverter On (Enable / Disable)

6. Controls

a. UPS startup, shutdown and maintenance bypass operations shall be accomplished through pushbutton controls on the front panel. Menu-driven user prompts shall be provided to guide the operator through system operation without the use of additional manuals. Pushbuttons shall be provided to display the status of the UPS and to test and reset visual and audible alarms. A mimic screen shall be available on the LCD to depict a single-line diagram of the UPS with switch positions and power flow.

7. On-Line Battery Test

a. The UPS shall be provided with a menu-driven On-Line Battery Test feature. The test shall ensure the capability of the battery to supply power to the inverter while the load is supplied power in the normal mode.

D. Static Transfer Switch

1. General

a. A static transfer switch and bypass circuit shall be provided as an integral part of the UPS. The static switch shall be a naturally commutated high-speed static (SCR-type) device rated to conduct full load current continuously. The switch shall have an overload rating to clear a 20-ampere load branch circuit breaker.

b. The static transfer switch control logic shall contain an automatic transfer control circuit that senses the status of the inverter logic signals and operating and alarm conditions. This control circuit shall provide an uninterrupted transfer of the load to an alternate bypass source without exceeding the transient limits specified herein, when an overload or malfunction occurs within the UPS or to bypass the UPS for maintenance.

2. Uninterrupted Transfer

a. The transfer control logic shall automatically turn on the static transfer switch,

transferring the critical AC load to the bypass source, after the transfer logic senses any of the following conditions:

1) Inverter overload capacity exceeded

2) Critical AC load overvoltage or under voltage

3) UPS fault condition

b. The transfer control logic shall inhibit an automatic transfer of the critical load to the bypass source if any of the following conditions are present:

1) Bypass frequency out of limits

2) Bypass out-of-synchronization range with inverter output

3. Uninterrupted Retransfer

a. Retransfer of the critical AC load from the bypass source to the inverter output shall be automatically initiated unless inhibited by manual control. The transfer control logic shall inhibit an automatic retransfer of the critical load to the inverter if one of the following conditions exists:

1) Bypass out of synchronization range with inverter output

2) Inverter/bypass voltage difference exceeding preset limits

3) Overload condition exists in excess of inverter full load rating

4) UPS fault condition present

4. Maintenance Bypass Switch

a. General

1) A manually operated maintenance bypass switch shall be incorporated into the UPS cabinet to directly connect the critical load to the bypass AC input power source, bypassing the rectifier/charger, inverter and static transfer switch.

5. Battery Cabinet

a. The battery cabinet shall include ten (10) year design life, valve-regulated, lead-acid battery cells housed in (1) separate external cabinet that matches the UPS cabinet styling to form an integral system lineup. All battery cell inter-connects shall utilize bolted connections, and all batteries shall include copper, inserted terminal posts allowing connector torque of 110 in-lb (12.4 Nm). Battery cells shall be mounted on slide-out trays for ease of maintenance. A battery disconnect circuit breaker shall be included for isolation of the battery pack from the UPS module. Casters and leveling feet shall also be provided with the battery cabinet for ease of installation. The battery cabinet can be bolted to the UPS cabinet, and an interconnecting cabling kit (DC wiring (pre–cut and pre–lugged) as well as control interface wiring) will be provided by the UPS manufacturer.

6. Included Options

a. Matching Maintenance Bypass and Distribution Cabinet

1) UPS Manufacturer to provide an Input and Output matching Paralleling Cabinet rated for 120kVA with a make-before-break maintenance bypass with Solenoid Key Release Unit (SKRU) interlock with a output capacity of 120kVA. Input voltage shall be 480 volts AC, 60Hz, three-phase, three-wire-plus-ground. Output voltage shall be 480 volts AC, three-phase, three-wire-plus-ground. Unit to provide (2) module input and output breakers to provide a means to isolate individual units with space for (2) additional module input and module output breakers. Thermal-magnetic breakers shall be included by the

UPS manufacturer for input isolation (RIB1 & RIB2) and output isolation (IOB1 & IOB2) in addition to maintenance bypass isolation breakers. Unit dimensions shall be a maximum of 33.2 in. (845mm) wide by 78.7 in. (2000mm) high by

39.5 in. (1003mm) deep. UPS Manufacturer into include a 25' paralleling cable kit to enable the UPS module to be paralleled with the output of other UPS having the same output voltage and configuration to create a parallel redundant system. When activated, the outputs of each module are synchronized and they share the output power. No other interfaces cards or controllers are required. Power cables from the UPS modules to thesystem paralleling cabinet and are to be provided by others.

b. UPS Start-Up

1) Start-up Service to be include one site trip within the 48 contiguous states by a factory authorized customer engineer after the UPS has been installed. The site trip includes the following services for both UPS modules andparalleling cabinet: non-powered inspection, UPS electrical and operational checkout, full parts and labor for any remedial work required on the UPS and battery cabinets, and customer operation training. Start-up includes remedial onsite labor, parts, and travel (48 states) for the full one-year warranty period. Start-up is included and can be scheduled at the customers designated time - 7 days, 24hrs a day for models.

2.3 SOURCE QUALITY CONTROL

A. Factory test complete UPS system before shipment. Include the following:

1. Test and demonstration of all functions, controls, indicators, sensors, and protective devices.
2. Full-load test.
3. Transient-load response test.
4. Overload test.
5. Power failure test.

B. Observation of Test: Give l4 days' advance notice of tests and provide opportunity for Owner's representative to observe tests at Owner's choice.

C. Report test results. Include the following data:

1. Description of input source and output loads used. Describe actions required to simulate source load variation and various operating conditions and malfunctions.
2. List of indications, parameter values, and system responses considered satisfactory for each test action. Include tabulation of actual observations during test.
3. List of instruments and equipment used in factory tests.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect,

test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Comply with manufacturer's written instructions.
2. Inspect interiors of enclosures, including the following:
   a. Integrity of mechanical and electrical connections.
   b. Component type and labeling verification.
   c. Ratings of installed components.
3. Inspect batteries and chargers according to requirements in NETA Acceptance Testing Specifications.
4. Test manual and automatic operational features and system protective and alarm functions.
5. Test communication of status and alarms to remote monitoring equipment.
6. Load the system using a variable-load bank to simulate kilovolt amperes, kilowatts, and power factor of loads for unit's rating. Use instruments calibrated according to NIST standards.
   a. Simulate malfunctions to verify protective device operation.
   b. Test duration of supply on emergency, low-battery voltage shutdown, and transfers and restoration due to normal source failure.
   c. Test harmonic content of input and output current less than 25, 50, and l00 percent of rated loads.
   d. Test output voltage under specified transient-load conditions.
   e. Test efficiency at 50, 75, and l00 percent of rated loads.
   f. Test remote status and alarm panel functions.
   g. Test battery-monitoring system functions.

E. Seismic-restraint tests and inspections shall include the following:

1. Inspect type, size, quantity, arrangement, and proper installation of mounting or anchorage devices.

2. Test mounting and anchorage devices according to requirements in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

F. The UPS system will be considered defective if it does not pass tests and inspections.

G. Record of Tests and Inspections: Maintain and submit documentation of tests and inspections, including references to manufacturers' written instructions and other test and inspection criteria.

Include results of tests, inspections, and retests.

H. Prepare test and inspection reports to be included in the commissioning report.

3.2 MANUFACTURER'S FIELD SERVICE

A. Field service and repair

1. Critical system faults/ UPS system failures shall be responded to within 4 hours, by a qualified technician.

2. Non critical system faults shall be responded to with 24 hours, by a qualified technician.

END OF SECTION